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Erratum: An indirect measurement of gas evolution in galaxies at $0.5 < z < 2.0$

by G. Popping,[1★] K. I. Caputi,[2] R. S. Somerville[3] and S. C. Trager[2]

[1] *European Southern Observatory, Karl-Schwarzschild-Strasse 2, D-85748 Garching, Germany*
[2] *Kapteyn Astronomical Institute, University of Groningen, Postbus 800, NL-9700 AV Groningen, the Netherlands*
[3] *Department of Physics and Astronomy, Rutgers University, 136 Frelinghuysen Road, Piscataway, NJ 08854, USA*

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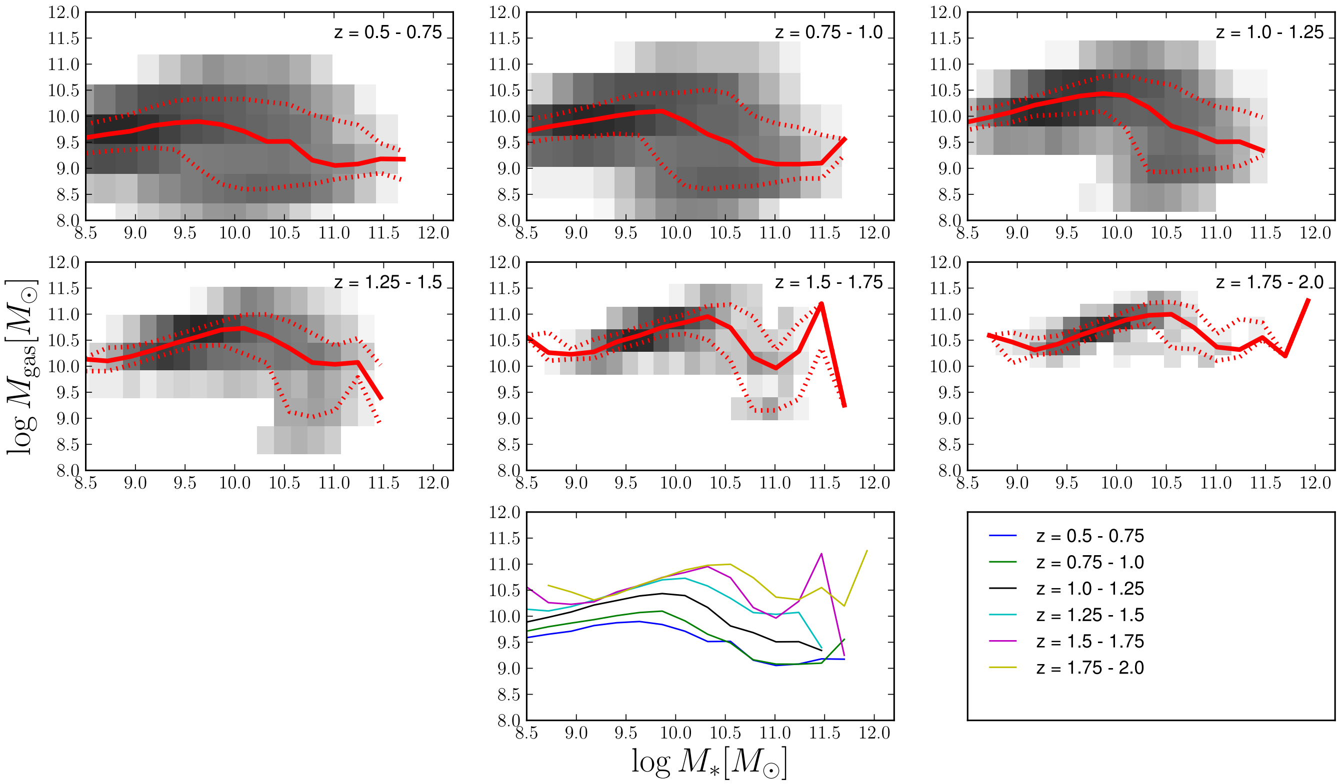

Figure 1. Total cold mass gas as a function of stellar mass for different redshift bins. The grey shaded area shows the log of the number of galaxies in each gas/stellar mass bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. The central bottom panel shows the 50 percentile curve for the data in each redshift bin.

The paper 'An indirect measurement of gas evolution in galaxies at $0.5 < 1 < 2.0$' was published in MNRAS, 425, 2386 (2012).

Due to an error, the disc sizes used for the galaxy sample taken from the COSMOS survey were incorrect. They were calculated based on luminosity distances rather than angular distances. We have recalculated the total cold gas and H_2 masses of the galaxy sample using the corrected disc sizes. The qualitative trends remain the same, although quantitatively we find significant differences in the total cold gas masses of the galaxies. Molecular hydrogen masses have not changed significantly.

We show the recalculated cold gas masses and cold gas fractions ($f_{\rm gas} \equiv \frac{M_{\rm gas}}{M_{\rm gas}+M_*}$) in Figs 1 and 2. These figures replace figs 6 and 7 in the original paper. The gas fraction of galaxies with high stellar masses ($M_\star > 10^{10.5}\,{\rm M}_\odot$) at redshifts $z > 1.5$ is now lower than in Popping et al. (2012).

We present the recalculated molecular fraction of the cold gas ($f_{\rm H2} \equiv \frac{M_{\rm H2}}{M_{\rm gas}}$) as a function of stellar mass and cold gas mass in Figs 3 and 4, respectively. These figures replace figs 11 and 13 in the original paper. We now find a strong evolution with time for the H_2 fraction of cold gas, with molecular fractions running from $f_{\rm H2} \sim 0.9$ at $z > 1.5$ to $f_{\rm H2} \sim 0.4$ at $0.5 < z < 0.75$. Unlike in Popping et al. (2012), we now find an increase in the cold gas molecular fraction with increasing gas

★ E-mail: gpopping@eso.org

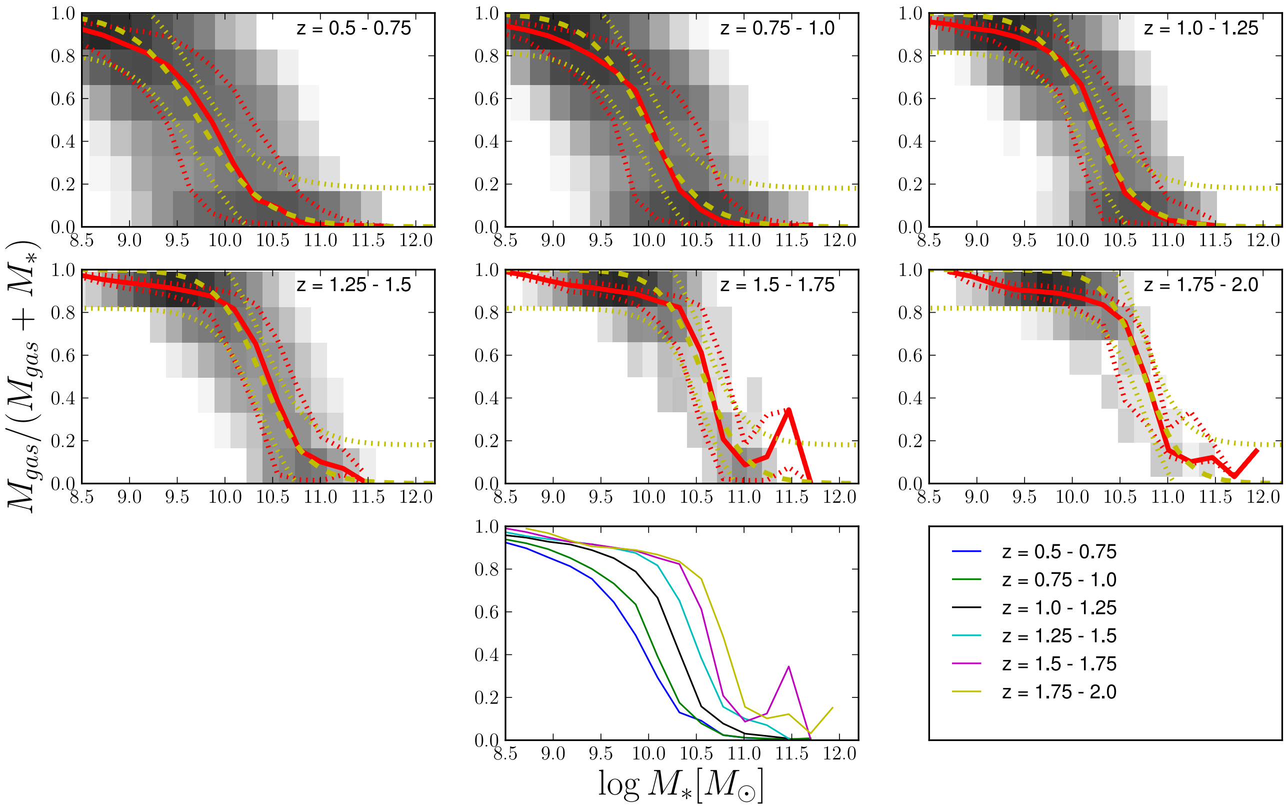

Figure 2. Total cold gas fraction (atomic plus molecular) as a function of stellar mass for different redshift bins. The grey shaded area shows the log of the number of galaxies in each bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. The central bottom panel shows the 50 percentile curve for the data in each redshift bin. The dashed and dotted yellow lines represents the fit and 1σ scatter of equation (1), respectively.

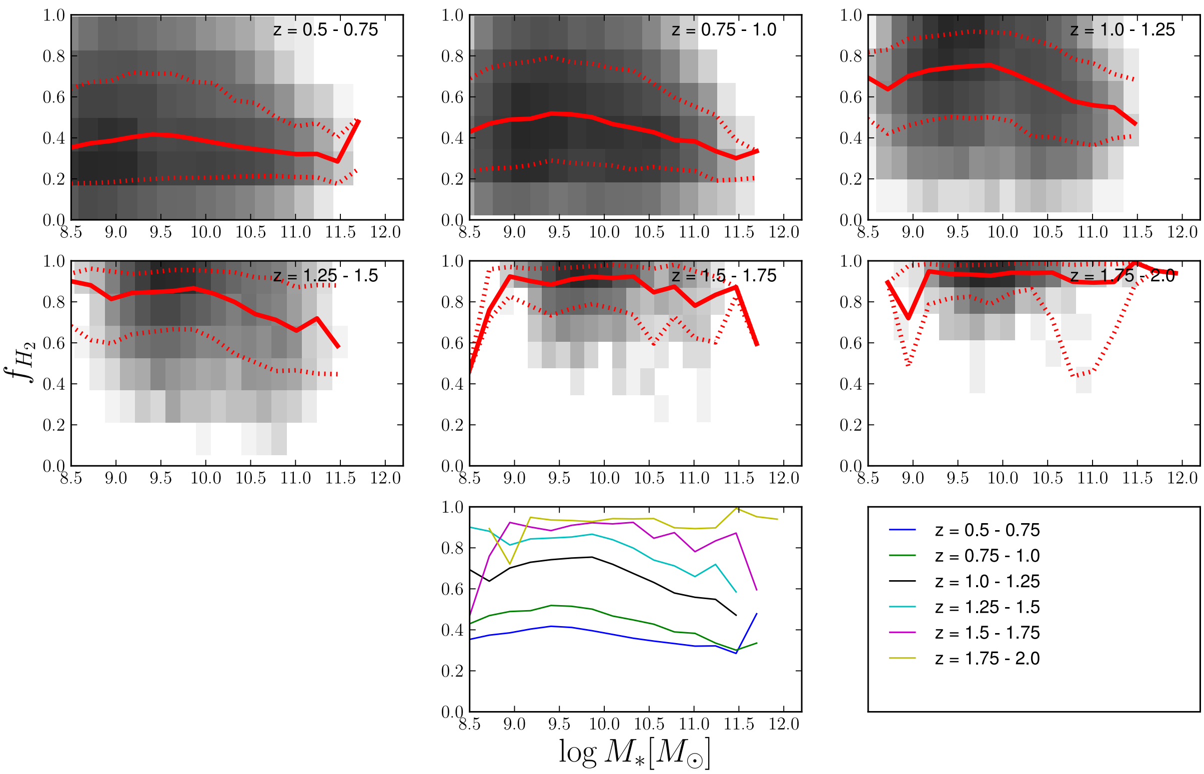

Figure 3. The fraction of H_2 in cold gas as a function of stellar mass for different redshift bins. The grey shaded area shows the log of the number of galaxies in each bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. The central bottom panel shows the 50 percentile curve for the data in each redshift bin.

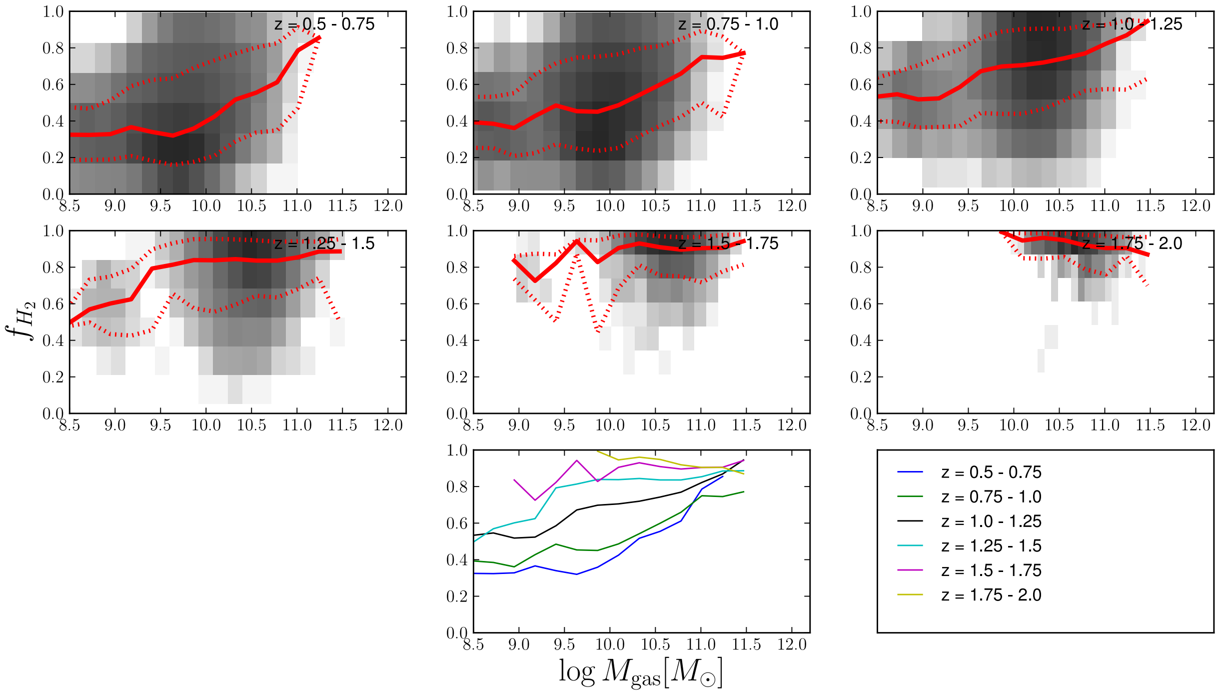

Figure 4. The fraction of H_2 in cold gas as a function of total gas mass for different redshift bins. The grey shaded area shows the log of the number of galaxies in each bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. The central bottom panel shows the 50 percentile curve for the data in each redshift bin.

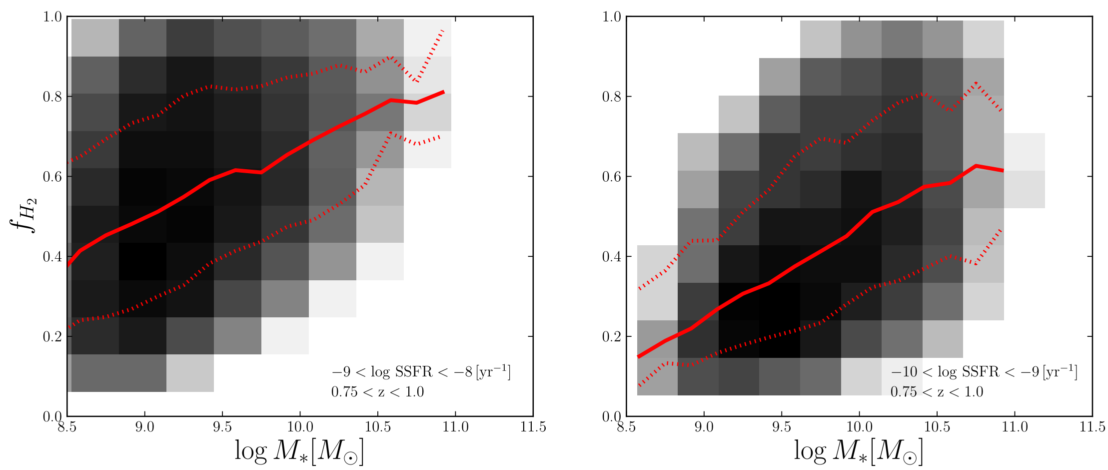

Figure 5. The fraction of H_2 in cold gas as a function of stellar mass for galaxies in two different bins of sSFR. All galaxies have redshifts $0.75 < z < 1.0$. The grey shaded area shows the log of the number of galaxies in each bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. Left-hand panel: galaxies with sSFR $-9 < \log \mathrm{sSFR} < -8\,[\mathrm{yr}^{-1}]$. Right-hand panel: galaxies with sSFR $-10 < \log \mathrm{sSFR} < -9\,[\mathrm{yr}^{-1}]$. Note that $f_{\mathrm{H_2}}$ increases with stellar mass.

mass. These trends are different from what we found in the original paper.

In Fig. 5 we show the molecular fraction of the cold gas as a function of stellar mass in two different bins of specific star formation rate (sSFR). This figure replaces fig. 12 in the original paper. With the corrected disc sizes we now find a much steeper increase in cold gas molecular fraction with stellar mass than was presented in Popping et al. (2012).

In Fig. 6 we show the cold gas fraction and relative H_2 content of galaxies as a function of stellar mass for galaxies with $\log \mathrm{sSFR}/\mathrm{yr}^{-1} > -10$. This figure replaces fig. 14 in the original paper.

We have repeated the fit to the cold gas fractions using the corrected inferred gas masses. The cold gas fraction of the galaxies in our sample can be characterized as a function of redshift and stellar mass by

$$\frac{M_{\rm gas}}{M_{\rm gas} + M_*} = \frac{1}{\exp^{(\log M_* - A)/B} + 1}, \tag{1}$$

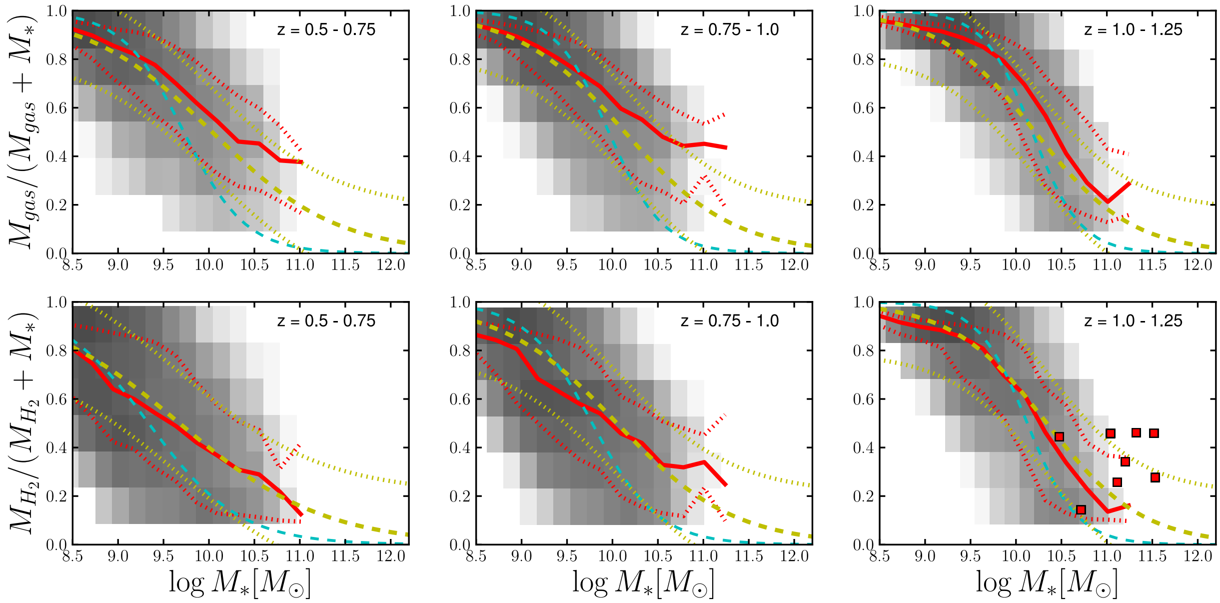

Figure 6. Gas fraction (top row) and $M_{\rm H_2}/(M_{\rm H_2}+M_*)$ (bottom row) of galaxies with $\log(\mathrm{sSFR}/\mathrm{yr}^{-1}) > -10$ as a function of stellar mass for different redshift bins. The grey shaded area shows the log of the number of galaxies in each bin, with the 50, 16 and 84 percentile curves shown with the red solid and dashed lines. Red squares are direct gas measurements from Tacconi et al. (2010). The dashed and dotted yellow lines represent the fit and scatter (1σ) to this sub-sample of galaxies, whereas the dashed cyan line is the fit to our full sample of galaxies. The sub-sample of 'main-sequence' galaxies has higher gas fractions at a given stellar mass.

where $A = 9.04\,(1+\frac{z}{1.76})^{0.24}$ and $B = 0.53\,(1+z)^{-0.91}$. When only selecting galaxies on the 'main sequence' of star formation we can characterize the gas fraction of galaxies using the same equation with $A = 9.0\,(1+\frac{z}{0.017})^{0.03}$ and $B = 1.10\,(1+z)^{-0.97}$. This formula is a good quantitative representation of our sample of galaxies up to $z = 2$, and has a scatter of $\sigma = 0.21$.

Due to a printing error, points were incorrectly placed in fig. 6, they should be ignored.

REFERENCES

Popping G., Caputi K. I., Somerville R. S., Trager S. C., 2012, MNRAS, 425, 2386
Tacconi L. J. et al., 2010, Nature, 463, 781

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